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(54) A PROCESS FOR FRESHENING AND DEODORIZING FABRICS IN A FABRIC DRYER

(71) We, THE PROCTER & GAMBLE COMPANY, a corporation organised under the laws of the State of Ohio, United States of America, of 301 East Sixth Street, Cincinnati, Ohio 45202, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a process whereby wrinkled or lightly soiled fabrics are contacted with the fabric freshener composition in a fabric dryer, thereby imparting a pleasant odor and fresh appearance thereto, and to compositions when used in this process.

The compositions used in the process of the present invention are specifically formulated for use on fabrics which are dried in an automatic clothes dryer, called herein a fabric dryer. The compositions comprise a combination of an alkali metal bicarbonate or carbonate salt, or mixtures thereof, as an odor controlling agent; an ethoxylated nonionic anti-static agent; optional fabric treating adjuncts other than the odor controlling agent and anti-static agent; and water, which is a wrinkle-removing agent when used in the manner disclosed herein.

Until the present invention, fabric freshener and anti-wrinkling processes and compositions were designed to provide these desirable benefits during a laundering procedure, utilizing the washer as the means to apply various additives which implement the freshener process. Thus, it has been customary to formulate fabric freshener and wrinkle removal additives for use in an aqueous laundry bath.

The treatment of lightly soiled and/or wrinkled fabrics with a fabric freshener without recourse to an unnecessary washing process would be a distinct advancement in the

art. For example, if lightly soiled fabrics which are wrinkled and have slight odors could quickly and effectively be refreshed and the odor removed, much expense and trouble to the user would be avoided. It has now been discovered that these benefits can be secured by applying the fabric freshener compositions herein described to the fabrics and drying them, with tumbling in a heated clothes dryer.

The use of an alkali metal bicarbonate or carbonate for controlling odor is appreciated by the prior art. For example, U.S. Patent 1,558,405, Smith, Deodorant Composition, issued October 20, 1925, discloses the incorporation of sodium bicarbonate and/or potassium bicarbonate or the like in a powdered deodorant composition.

U.S. Patent 3,317,372, Hart, Household Deodorant, issued May 2, 1967, relates to a household deodorant which is described as suitable for deodorizing vomitus. More particularly, the patent teaches the use of sodium carbonate and sodium bicarbonate in combination with a wetting agent and water.

Canadian Patent 511,607, Cacies, issued April 5, 1955, for Soap Compositions, relates to soap powders with alkaline adjuncts such as sodium carbonate to improve the detergent properties of the soap.

The use of towels soaked with water to humidify dryer air and help remove fabric wrinkles has been suggested by dryer manufacturers. However, humid air is not as effective for removing wrinkles as applying water directly to fabrics in the present manner.

According to the present invention there is provided a process for freshening and deodorizing wrinkled or lightly soiled fabrics comprising commingling said fabrics under heat in a fabric dryer with an effective amount of a fabric freshener composition, comprising

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- (a) from 1% to 10% by weight of a water-soluble deodorant selected from alkali metal bicarbonate and carbonate salts, and mixtures thereof;
- (b) from 0.5% to 5% by weight of an ethoxylated nonionic antistatic agent;
- (c) from 0% to 10% by weight of a fabric treating adjunct agent other than an antistatic agent of component (b) and a deodorant of component (a); and
- (d) the balance of the composition comprising water.

The present invention further relates to fabric freshener, when used in the process of the present invention, of the above-mentioned composition.

The Water-Soluble Deodorant

The water-soluble deodorant used in the present compositions includes the alkali metal bicarbonate and/or carbonate salts. Mixtures of such water-soluble deodorants can also be employed. For economy, the sodium and potassium bicarbonate and carbonate salts are used herein, with sodium bicarbonate being most preferred.

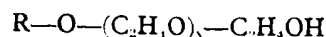
The water-soluble deodorant is present in the fabric freshener compositions in an amount of from 1% to 10%, preferably from 2% to 5%, by weight. When there is a mixture of alkali metal bicarbonate and carbonate, the weight ratio range of bicarbonate to the carbonate is from 10:1 to 1:10, preferably 1:1.

The Ethoxylated Nonionic Surface Active Anti-Stats

The dryer-added fabric freshener compositions and articles herein also contain a nonionic material which serves as an anti-stat on the dried fabrics. While not intending to be limited by theory, it appears that the tactilely imperceptible amount of moisture sorbed by the hygroscopic anti-stats is sufficient to raise the surface conductivity of fabrics treated therewith by a factor of a million-fold, or greater. This increased surface conductivity serves to dispel undesirable static electrical charges in a rapid and efficient manner. The nonionics used herein also serve to emulsify optional components such as perfumes, thereby providing stable, homogeneous compositions containing such substantially water-insoluble adjunct materials.

The ethoxylated anti-static agents used herein include those materials which fall in the general class of ethoxylated surfactants. A listing of such highly ethoxylated surfactants now found to be useful as through-the-dryer anti-stats appears in McCutcheon's "Detergents and Emulsifiers" North American Edition, 1973 Annual. The anti-stat use of such materials is described in British Patent Specification 1,493,202.

Preferred hygroscopic surfactants which can be employed as anti-static agents in the manner of this invention include the non-ionic ethoxylates of the general formula



where R is selected from the group consisting of primary secondary, and branched chain alkyl hydrocarbyl moieties; primary, secondary and branched chain alkenyl hydrocarbyl moieties; and primary, secondary and branched chain alkyl- and alkenyl-substituted phenolic hydrocarbyl moieties; said hydrocarbyl moieties having a hydrocarbyl chain length of from about 6 to about 20, preferably 10 to 18, carbon atoms. In the above general formula x is an integer of at least 2, preferably 3 to 50, most preferably about 6 to 20.

Specific examples of nonionic hygroscopic surfactants which additionally serve as the anti-stats of this invention are as follows. The examples are only by way of exemplification, and are not intended to be limiting of such materials.

Straight-Chain, Primary Alcohol Ethoxylates

The hygroscopic ethoxylates of hexa-, hepta-, octa-, nona-, deca-, undeca-, dodeca-, tetradeca-, hexadeca- and octadeca-alcohols condensed with at least 2 moles of ethylene oxide are useful herein. Exemplary ethoxylates of primary alcohols include n-C₁₆EO(4), n-C₁₂EO(20) and n-C₁₆EO(50). The higher ethoxylates of mixed natural or synthetic alcohols in the "coconut" and "tallow" chain length range are also useful herein. Specific examples of such materials include coconut-alkyl EO(45) and tallowalkyl EO (45).

Straight-Chain, Secondary Alcohol Ethoxylates

The hygroscopic ethoxylates of 2-decanol, 2-tetradecanol, 3-hexadecanol, 2-octadecanol, 4-eicosanol, and 5-eicosanol are useful surface active anti-static agents in the context of this invention. Exemplary ethoxylated secondary alcohols useful herein as the anti-static agent are: 2-C₁₀EO(6), 2-C₁₂EO(45), 2-C₁₄EO(20), 2-C₂₀EO(80), 2-C₁₆EO(60) and 2-C₁₈EO(20). Commercial mixtures of secondary alcohols having an average hydrocarbyl chain length of 8 to 20 carbon atoms condensed with an average of 2-40 moles of ethylene oxide per mole of alcohol are also useful herein.

Alkyl Phenolic Ethoxylates

As in the case of alcohol ethoxylates, the hygroscopic ethoxylates of alkylphenols, particularly monohydric alkylphenols, are useful as the anti-static agent of the instant invention. The EO_x-EO₁₀₀ ethoxylates of commercially available alkyl phenols such as p-octyl phenol and p-nonyl phenol are readily

prepared by well known condensation reactions.

- 5 Exemplary ethoxylated alkyl phenols useful as the anti-static agent herein are: p-octylphenol EO(45), p-nonylphenol EO(45) and p-decylphenol EO(40).

Olefinic Ethoxylates

- 10 The alkenyl alcohols, both primary and secondary, and alkenyl phenols corresponding to those disclosed immediately hereinabove can be ethoxylated with from 2 to 50, or greater, moles of ethylene oxide and thereby rendered hygroscopic and useful as the anti-static agent herein. Exemplary alkenyl ethoxylates herein include 2 - n - dodecenol EO(60), 3 - tetradecenol EO(30), p - (2-nonenyl)phenol EO(40) and 2 - tetradecen-4 - ol EO(45).

Branched Chain Ethoxylates

- 20 Branched chain primary and secondary alcohols are available from the well known "OXO" process and can be ethoxylated and employed as the anti-static agents herein. Exemplary branched-chain alkoxyates are as follows: 2 - methyl - 1 - dodecanol EO(60); 25 3 - ethyl - 2 - tetradecanol EO(100); 2-methyl - 1 - hexadecanol EO(6), and the like.

- 30 As can be seen by the foregoing, a wide variety of hygroscopic ethoxylated nonionic surfactants are useful as the anti-static agent herein. It will be recognized that the designation of the degree of ethoxylation of the listed compounds is an average value, and commercial materials contain mixtures of hydro- 35 carbyl materials having differing degrees of ethoxylation centering around an average value.

- 40 The preferred ethoxylates herein are the EO₆ to EO₂₅ ethoxylates of mixed tallow alcohols and mixed coconut alcohols. These commercially available materials are highly hygroscopic and quite effective anti-stats when employed in the manner of this invention. 45 Coconutalkyl EO(6-12) and tallowalkyl EO(10-25) are especially preferred mixed alcohol ethoxylates for use herein. Lauryl EO(6-12) is also especially preferred herein.

Fabric Treating Adjuncts

- 50 The processes and articles herein described can employ minor proportions (i.e., usually about 0.01% to 10% by weight of the fabric freshener composition) of various optional ingredients which provide additional fabric 55 freshening benefits. Such optional ingredients include perfumes, optical brighteners, fumigants, bacteriocides, fungicides, flame retardants, and bleaches. Specific examples of typical additives useful herein can be found in any current *Year Book of the American Association of Textile Chemists and Colorists*. 60 One type of optional ingredient herein in-

cludes the well known quaternary ammonium anti-static agents. While the hygroscopic non-ionic anti-stats herein are quite effective for their intended use, minor proportions of quaternary salts can optionally be employed in combination therewith to provide an added increment of static control as well as to contribute to fabric appearance. Specific examples of such quaternary salts include di - (tallowalkyl)dimethylammonium chloride and di-(tallowalkyl)dimethylammonium methylsulfate. 65 70

The present fabric freshener composition can additionally be formulated to include a fabric softener. Such fabric softeners are selected from those which melt (or flow) at dryer operating temperatures. The fabric softeners used herein are characterized by a melting point above 38°C. Lower melting softeners flow at room temperature and result in an undesirable tackiness on the fabrics treated therewith. Highly preferred softeners herein melt (or flow) at temperatures of about 45°C to about 70°C. 75 80 85

It is to be understood that mixtures of fabric softeners can be employed herein concurrently to achieve multiple conditioning benefits. For example, various alcohol-type softeners and quaternary ammonium softeners can be used as admixtures which soften and provide static control benefits. 90

Preferred cationic softeners herein include the quaternary ammonium salts such as ditallowalkyldimethylammonium methylsulfate and dicoconutalkyldimethylammonium methylsulfate, i.e., corresponding to the antistats listed above. 95

Another type of fabric softener employed in the present compositions comprises the esterified cyclic dehydration products of sorbitol, which are prepared by esterifying the sorbitol reaction product (e.g. sorbitan) with a fatty acyl group utilizing methods known in the art. 100 105

The preferred alkyl sorbitan esters herein comprise sorbitan monolaurate, sorbitan monomyristate, sorbitan monopalmitate, sorbitan monostearate, sorbitan dilaurate sorbitan dimyristate, sorbitan dipalmitate, sorbitan distearate, and mixtures thereof, and mixed coconutalkyl sorbitan mono-, di-, tri- and tetra-esters and mixed tallowalkyl sorbitan mono-, di-, tri- and tetra-esters. 110 115

Other adjuncts which are suitable for use in the instant compositions are disclosed in U.S. Patent 3,843,395, Morton, Process for Softening Fabrics in a Dryer, issued October 22, 1974, and U.S. Patent 3,686,025, Textile Softening Agents Impregnated into Absorbent Materials, issued August 22, 1972. 120

The Fabric Freshening Process

In its simplest aspect, the method of utilizing the present fabric freshening compositions comprises applying the compositions directly 125

to lightly soiled or wrinkled fabrics and drying the fabrics with heat (generally 50°C to 100°C) and tumbling in an automatic dryer. It will be appreciated that any convenient means for applying an effective amount of the fabric freshener composition to the fabrics prior to, or concurrently with, drying can be used.

One method of application consists of simply pouring an effective amount of the fabric freshener composition onto the wrinkled or lightly soiled fabrics.

An in-the-dryer method of application comprises placing the fabric freshener composition in a flexible porous pouch and commingling said pouch in a dryer, under heat, with the fabrics to be freshened. The tumbling action of the dryer causes the freshener composition to be dispensed from the pouch and deposited on the fabrics. Alternatively, a rigid hollow container which serves as a reservoir for the composition can be used. The container (conveniently, plastics) has one or more openings of suitable size (ca. 0.2 mm—3 mm). Again, the tumbling action of the dryer causes the composition in the container to migrate through the openings and onto the fabrics.

When the compositions herein are applied to fabrics in the dryer (i.e., concurrently with the drying operation) it is preferred that the dispenser release substantially all of the composition during the first few minutes of the drying cycle. Once the cycle is finished, the clothes are both dry and refreshed.

A convenient method of applying the fabric freshener composition to lightly soiled or wrinkled fabrics consists of placing the compositions in a "shake" and/or squeeze bottle, preferably plastics, containing a plurality of openings at one end, shaking droplets of the fabric freshener uniformly onto the fabrics, and then drying the fabrics with heat and tumbling in an automatic dryer.

Another preferred method of applying the fabric freshener composition to lightly soiled or wrinkled fabrics consists of placing the composition in a plastics bottle equipped with a spray nozzle which is adjusted to provide droplets of a size within the preferred range disclosed hereinafter.

It should be noted that the size of the droplets of the fabric freshener which are dispensed onto the fabrics can be quite important to the optimal use of the present compositions. Of course, it is desirable that the fabric freshener composition be uniformly distributed on the fabrics being treated. Since the compositions are liquid, it is also desirable to be careful not to soak the fabrics, since an unnecessarily long drying cycle would be

needed, not to freshen the fabrics, but simply to dry them.

Usage tests have shown that if the droplets of fabric freshener are too small, they tend to stand on the fabric nap and do not coalesce readily, giving the appearance that the fabrics are not wet enough. The average user then tends to apply an additional, unnecessary amount of the composition to the fabric; the resulting oversaturation requires a longer drying period. Of course, if the droplets are very large, the fabrics wet out very rapidly in isolated spots, with large, dry, untreated areas between.

In a preferred embodiment of the present invention, the fabric freshener composition is applied to the lightly soiled and wrinkled fabric at a rate of from 0.02 g to 2.0 g, preferably 0.05 g to 0.50 g, per gram of dry weight of fabric being treated. The best results are obtained when the composition is applied as droplets having diameters from 0.2 mm to 1.5 mm, preferably 0.3 mm to 1.0 mm.

EXAMPLE I

A fabric freshener composition was prepared, as follows.

Ingredient	% (wt.)
Sodium bicarbonate	3
"Kyro" EOB (Trade Mark)*	1
Perfume	0.05
Water	Balance

The composition of Example I is prepared by simply mixing the ingredients.

The above-described composition was applied to lightly soiled and wrinkled fabrics as droplets (ca. 5.0 mm avg. size) using a trigger action sprayer having a nozzle which was adjustable to provide composition droplets in the desired range. The composition was applied at a rate of about 1 g. of composition to about 10 g. of fabrics.

The fabrics were then placed in an automatic dryer and dried, with tumbling action, at a temperature of 60°C—80°C for a period of 15 minutes. The fabrics were rendered free of wrinkles and static, and had a fresh appearance and pleasant odor. Surprisingly, the sodium bicarbonate was not visible on the refreshed fabrics.

In the foregoing procedure, substantially the same results are obtained when sodium carbonate is substituted for the sodium bicarbonate.

* A commercial nonionic surfactant comprising an average of eleven carbon atoms, ethoxylated to an average of 9 ethyleneoxy groups per molecule.

EXAMPLE II

A fabric freshener composition is as follows:

	Ingredient	% (wt.)
5	Sodium carbonate	2
	Tetraethyleneglycol, decyl ether	1
	Perfume	0.03
	Water	Balance

The composition of Example II is prepared by simply mixing the ingredients.

Lightly soiled and wrinkled fabrics are treated with the above composition according to the procedure of Example I. All wrinkles and static are removed from the fabrics and, in addition, they have a fresh appearance and pleasant odor.

In the composition of Example II the tetraethyleneglycol, decyl ether, is replaced by an equivalent amount of "Pluronic" (Trade Mark) L-43 (a nonionic surface-active agent prepared by the addition of ethylene oxide to polypropylene glycol) resulting in good freshening and static control benefits.

EXAMPLE III

A fabric freshener composition is prepared consisting of 2% sodium bicarbonate; 1% sodium carbonate; 1.5% Neodol 25-9 (a commercial nonionic surfactant containing an organic group of from 12 to 15 carbon atoms and an average of 9 ethyleneoxy groups per molecule); 0.1% perfume (aqueous solution); and the balance water.

The composition of Example III is placed in a shake bottle and sprinkled onto fabrics having an unpleasant, body-type odor at a rate of 1 g/10 g of fabrics. The fabrics are dried, with tumbling, in a heated (70°C) vented dryer for 20 minutes. The odor is substantially removed and the dry fabrics have a fresh, unwrinkled appearance.

In the composition of Example III the Neodol 25-9 is replaced by an equivalent amount of

- (a) the condensation product of six mols of ethylene oxide with one mole of mixed aliphatic alcohols derived from coconut oil;
- (b) the condensation product of nine mols of ethylene oxide with one mol of mixed aliphatic secondary alcohols with carbon chain lengths from 11 to 15;
- *(c) the condensation product of ethylene oxide with polypropylene glycol characterized by an HLB of 12.0; and
- (d) a product of the esterification of one equivalent of polyethylene glycol with an average molecular weight of 400 with one equivalent of stearic acid.

* HLB in composition (c) above is the abbreviation for the hydrophilic-lipophilic balance of the compound.

Fabrics treated with the above compositions in the manner described in Example I, have a fresh appearance and pleasant odor.

WHAT WE CLAIM IS:—

1. A process for freshening and deodorizing wrinkled or lightly soiled fabrics comprising commingling said fabrics under heat in a fabric dryer with an effective amount of a fabric freshener composition, comprising,
 - (a) from 1% to 10% by weight of a water-soluble deodorant selected from alkali metal bicarbonate and carbonate salts, and mixtures thereof;
 - (b) from 0.5% to 5% by weight of an ethoxylated nonionic antistatic agent;
 - (c) from 0% to 10% by weight of a fabric treating adjunct agent other than an antistatic agent of component (b) and a deodorant of component (a); and
 - (d) the balance of the composition comprising water.
2. The process of Claim 1 wherein the deodorant is sodium bicarbonate, sodium carbonate, or mixtures thereof.
3. The process of Claim 1 wherein the ethoxylated nonionic antistatic agent is selected from (a) the condensation product of six mols of ethylene oxide with one mol of mixed aliphatic alcohols derived from coconut oil; (b) the condensation product of nine mols of ethylene oxide with one mol of mixed aliphatic secondary alcohols with carbon chain lengths from 11 to 15 carbon atoms; (c) the condensation product of ethylene oxide with propylene glycol characterized by an HLB of 12.0; and (d) a product of the esterification of one equivalent of polyethylene glycol with an average molecular weight of 400 with one equivalent of stearic acid.
4. The process of Claim 1 wherein the fabric treating adjunct is selected from quaternary ammonium salts, sorbitan esters, and mixtures thereof.
5. The process of Claim 1 wherein the fabric freshener composition is applied in an amount of from 0.02 g. to 2.0 g. per gram of dry weight of fabric being treated.
6. The process of Claim 1 wherein the fabric freshener composition is uniformly distributed over the fabrics in droplet form.
7. The process of Claim 6 wherein the fabric freshener composition is applied as droplets having diameters from 0.2 mm to 1.5 mm.
8. The process of Claim 1 substantially as hereinbefore described in the Examples.
9. Fabrics treated by the process of any of Claims 1 to 7.
10. A fabric freshener, when used in the process of Claim 1, comprising:

- (a) from 1% to 10% by weight of a water-soluble deodorant selected from alkali

- metal bicarbonate and carbonate salts, and mixtures thereof;
- (b) from 0.5% to 5% by weight of an ethoxylated nonionic antistatic agent;
- 5 (c) from 0% to 10% by weight of a fabric treating adjunct agent other than an antistatic agent of component (b) and a deodorant of component (a); and
- 10 (d) the balance of the composition comprising water.
11. The composition of Claim 10 wherein the deodorant is sodium bicarbonate, sodium carbonate or a mixture thereof.
- 15 12. The composition of Claim 10 wherein the deodorant is a mixture of sodium bicarbonate and sodium carbonate at a weight ratio of sodium bicarbonate to sodium carbonate of 1:1.
- 20 13. The composition of Claim 10 wherein the ethoxylated nonionic antistatic agent is selected from (a) the condensation product of six mols of ethylene oxide with one mol of mixed aliphatic alcohols derived from coconut oil; (b) the condensation product of nine
- 25 mols of ethylene oxide with one mol of mixed aliphatic secondary alcohols with carbon chain lengths from 11 to 15 carbon atoms; (c) the condensation product of ethylene oxide with propylene glycol characterized by an HLB of 12.0; and (d) a product of the esterification of one equivalent of polyethylene glycol with an average molecular weight of 400 with one equivalent of stearic acid.
- 30 14. The composition of Claim 10 wherein the fabric treating adjunct is selected from quaternary ammonium salts, sorbitan esters, and mixtures thereof.
- 35 15. The composition of Claim 10 wherein the fabric freshener composition is in a container equipped with a nozzle which provides droplets having a diameter of from 0.2 mm to 1.5 mm.
- 40 16. The composition of Claim 10 substantially as hereinbefore described in any of the Examples.
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